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The Chemical Composition of Some Venetian Reds.

—BY—

J. B. WEEMS—J. C. BROWN.

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THE CHEMICAL COMPOSITION OF SOME VENETIAN REDS.

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In connection with the analysis of some samples of paints intended for painting several large buildings, it was found that the venetian red which had been supplied by the contractor, had such a peculiar appearance so that it was decided to investigate it. On making an analysis of the sample of this pigment the following results were obtained:

Moisture	1.08%
Insoluble matter	1.91%
Ferric Oxide Fe_2O_3	8.75%
Calcium Carbonate $CaCO_3$	88.28%
	100.02%

On the examination of the analysis, it is readily seen that substance is rather calcium carbonate than venetian red. The common impression that one receives on investigating the subject is that venetian red is composed to a large extent if not entirely of ferric oxide. For example, Church (1) says of venetian red: "Originally, Venetian red consisted of a native ferric oxide or red haematite, less purplish in its tints and washes than Indian red. But of recent years the name appears to have been transferred to a particular quality of artificial ferric oxide made by calcining green vitriol. When this salt is heated in a crucible, the upper portion of the product, which has been less strongly heated than the lower, is of a brighter red than the remainder, and after washing and grinding is sold as Venetian red. If moistened with a solution of nitre, again heated, and then ground and washed, the red tint of the product becomes somewhat brighter."

Blount and Bloxam (2) state regarding Venetian red as follows, under the term, Red Oxide of iron: "This is the commonest iron pigment and most closely approaches pure ferric oxide in composition. It is al-

(1) Chemistry of Paints and Painting. P. 160
(2) Chemistry for Engineers and Manufacturers. P. 363.

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so known as rouge, and its various shades are known as Indian red, venetian red, etc. Certain haematites of good color are ground and used as a pigment, and the ferric oxide prepared artificially is also largely employed. The principal source of the artificial variety is green vitriol (copperas). When this is ignited, as in the manufacture of Nordhausen sulphuric acid, it loses water, sulphur dioxide, and sulphur trioxide, the residue being ferric oxide. It is also prepared from the sulphates iron pyrites, as is practiced in this country (England) where the pigment is the main product and the sulphur is not condensed. Ferric oxide pigments can also be obtained by igniting the ochres, this process allowing of the obtainment of a more extensive range of shades. Refuse liquors containing iron, e. g., the pickling liquor from tin plate works, precipitated by lime, and the crude iron obtained roasted and used as a pigment. The shade of ferric oxide depends on the temperature of ignition, a purple tone predominating in those specimens which have been most strongly heated. Red oxide pigments are extremely permanent and are largely used, chiefly for rough out door work. They are commonly diluted with such substances as barium sulphate, and calcium carbonate, and many contain from 50 to 95 per cent of ferric oxide." These statements and the analysis of venetian red given above which contained only 8.75 per cent of ferric oxide, naturally suggested an investigation of the venetian reds and similar pigments found on the market.

One sample of venetian red purchased upon the local market gave on analysis the following results:

Moisture	7 44%
Ferric oxide $Fe_2 O_3$	24 01%
Calcium oxide Ca O	25.42%
Sulphur trioxide $S O_3$	38.98%
Undetermined	4.15%
	100.00%

Another sample was found to contain:

Moisture	7 76%
Ferric oxide $Fe_2 O_3$	23.18%
Calcium oxide Ca O	26.20%
Sulphur trioxide $S O_3$	39 42%
Undetermined	3.44%
	100.00%

It will be noticed that these samples contain practically the same amount of ferric oxide and they are to a large extent Calcium Sulphate or Gypsum.

The first consideration of the problem under investigation was to discover the composition of the pigments placed on the market by the manufacturers, as it was considered that the analysis of the two samples found in the local markets was only an indication and that the products on the market should be reserved for consideration at some future time.

The samples that have been analyzed were obtained direct from the manufacturers. The results are given in the following table:

ANALYSES OF INDIAN REDS, RED OXIDES, AND VENETIAN REDS.

	Insoluble	Ferric Oxide	Alumina	Calcium Oxide	Carbon Dioxide	Magnesium Oxide	Sulphur Trioxide	Moisture	Loss on Ignition	Undetermined
(1) Pure indian red	.67	94.35	2.69	.....	.....	.....	.....	.20	1.53	.46
(2) Pure indian red	.48	96.93	1.10	.....	.....	.....	.....	.41	.90	.18
(3) Pure indian red	.61	97.49	.77	.....	.....	.....	.....	.36	.80	.....
(4) Superfine indian red	.65	95.05	3.96	.....	.....	.....	.....	.06	.19	.09
(5) Imported red oxide	19.42	77 93	.25	1.21	.....	....	...	.20	1·41	.....
(6) Ordinary red oxide	10.82	38.30	5.43	17.99	1.32	.96	19.20	2.50	3.45	.03
(7) Red oxide	11.65	53.95	12.03	9.33	.....	.68	1.55	.01	10.95	.....
(8) Red oxide	.71	94.88	3.20	.....	.	.....	.....	.15	1.98	.....
(9) Red oxide	13.61	70.15	2.09	6.12	1 45	....	5.85	.13	1.23	.....
(10) Imported red oxide	1.33	29.22	1.76	23 19	.....	.30	37.00	5.47	2.52	.....
(11) Best tuscan red oxide	.64	59.09	1.20	15.27	.....	.40	23.15	.01	.81	.....
(12) Turkey red oxide	1.90	51.97	2.31	14.85	.....	.52	17.92	6.36	4.34	.....
(13) Turkey red oxide	15 74	64.00	6.15	5.88	.....	.48	.20	.06	7.25	.24
(14) American venetian red	55.92	35.64	1.71	2.90	.....	.....	.....	.44	3.94	.....
(15) Superfine venetian red, dark	18.75	76.31	2.11	.65	.45	.....	.....	.05	1.74	.....
(16) Light brilliant venetian red	6.06	11.57	1.01	25.46	1.65	1.88	35.15	12.12	5.30	.....
(17) Cutter's eng. venetian red	.30	22.00	1.79	29.03	.....	.....	34.90	7.51	3.44	1.13
(18) American venetian red	20.36	16.78	2.35	18.66	27.19	12.06	2.45	.10	.....	.05
(19) Royal venetian red	2.10	20 83	2.42	31.65	7.22	1.34	28 70	3.50	2.79	.....
(20) Imported venetian red	27 30	61.01	6.38	.88	.....	.....	2.05	.09	2.03	.26
(21) Venetian red	1.07	9.50	.28	45.00	12.06	.50	25.00	6.84	.....	.....
(22) Light victoria venetian	1 46	22.79	1.19	27.95	.....	.79	36.15	6.72	3.76	.....
(23) Windsor venetian red	18.85	24.43	1.84	26.89	13.14	1.33	11.15	2.17	.....	.20
(24) V. C. Eng. venetian red	2.85	18.79	3.38	39.21	18.39	.52	16.30	.01	.....	.55
(25) Royal venetian red	1.82	9.00	.57	30.47	39.40	18.26	.....	.30	.....	.18
(26) Home imported venetian red	10.81	18.78	2.05	28.50	1.78	1.36	22.67	10.68	3.95	.....

On examination of the table of analysis it is found that the Indian reds are nearly pure ferric oxides; the red oxides vary from 29.22 to 94.88 per cent. of ferric oxide while the other substanec is largely Calcium Sulphate.

In the pigments that were purchased under the name of venetian red it is found that these vary in the amount of ferric oxide present from 9.00% to 76 31% as in the sample of "Superfine Venetian red dark."

The question which naturally presents itself in connection with these analyses is, what is the effect of using a pigment containing as much as 80% or 90% of Calcium carbonate or Barium sulphate ?

At present our knowledge of these effect of the substances is not in a very satisfactory condition to say the least, and much is needed in the way of investigation.

With the attention which is being given to the subject of adulteration of foods, is it well to have conditions such that one substance containing 9 00% of ferric oxide is sold under the same name as one having 70.00% or more ? This question is an important one for engineers and others who may desire a pure pigment and in its place there is supplied a substance composed almost entirely of calcium carbonate or calcium sulphate (gypsum) and which contains little of the pigment desired.

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